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## *The Motion of* Σ 2525. By S. W. Burnham, M.A.

For some years this has been a difficult pair to measure. When it was discovered and first measured by Struve in 1830, it could be readily seen with the smallest instrument ordinarily used in double-star work. Since that time the distance has gradually lessened, and for the past few years only the largest refractors can separate the components. Until recently the change has been principally in distance, and all the measures made during the first fifty years are well represented by rectilinear motion. Notwithstanding that these positions appear to represent the movement of one star passing another from proper motion, the chances are greatly in favour of a physical relation between them.

I have made a set of measures of this pair with the 36-inch equatoreal under very favourable atmospheric conditions. Although the distance between the components is less than 0″·2, it is easy enough with this instrument, since it is well separated with medium powers, and the measures should have a good degree of accuracy.

The results found on the several nights are ollows :—

| | ° | ″ | |
|---|---|---|---|
| 1891·326 | 343·7 | 0·20 | 8·0 . . . 8·1 |
| ·389 | 343·4 | 0·17 | 8·0 . . . 8·2 |
| ·427 | 163·7 | 0·17 | 8·0 . . . 8·5 |
| ·449 | 342·7 | 0·17 | 8·0 . . . 8·1 |
| 1891·40 | 343·4 | 0·18 | |

In very close pairs of this kind, and particularly when the relative motion is not well understood, it is important to assign the proper quadrant to the smaller star. In the first three measures the angles were set down as above with no thought of the earlier observations, with a note, "quadrant certain," in the second measure. On the following night the angle was reversed, and on the last night the smaller component seemed to be on the preceding side, although the difference in the magnitudes was very small. The magnitudes in Struve are 7·4 and 7·6.

In order to determine this question more certainly, if possible, I examined the pair again on several nights, with the following results:

1891·485. Not very good seeing, but the smaller star appears to be in 160°.

1891·540. The stars are so nearly equal that it is impossible to tell with certainty which is the smaller. Well separated.

1891·578. The preceding star appears to be certainly the smallest, but the difference is perhaps not more than 0·1 or 0·2 of a magnitude. Splendid seeing.

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The quadrant, therefore, is still uncertain, but the weight of the evidence, from my own observations, seems to be in favour of the position-angle being as given in the mean result of the several measures, and not 163°·4; but the latter seems to be more in harmony with the earlier observations. This can probably be definitely settled by the observations of next year. If the angle is what I have assumed it to be, then the angular movement has been 270° since 1830, and we should have sufficient data for an approximate determination of the period. On the other hand, if this position belongs in the opposite quadrant, then all the measured positions lie substantially in a straight line, and it would be impossible to say from this evidence alone whether the relative change is due to proper or orbital motion.

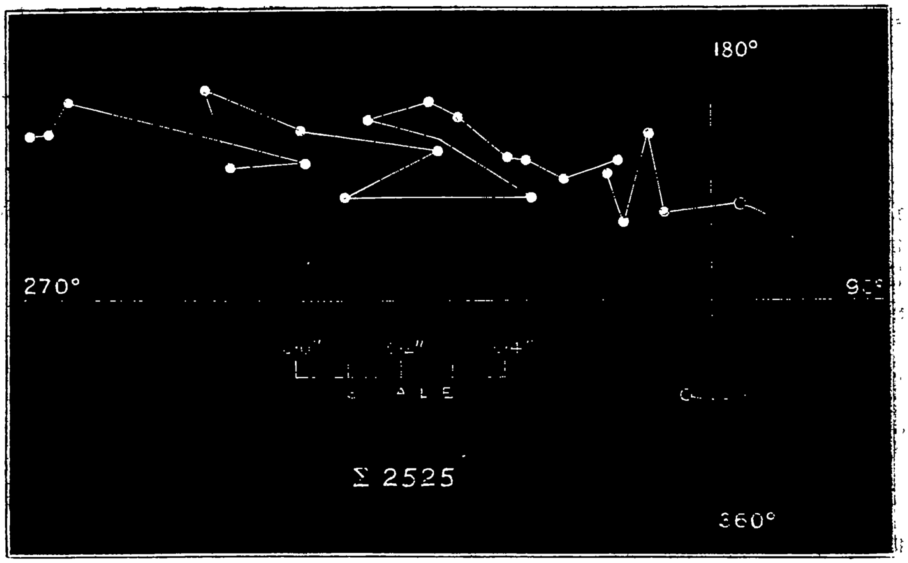
In the interest of a future investigation, I have collected from original sources, and arranged in chronological order, all the micrometrical observations of this pair, and give them here:—

*Measures of* Σ 2525.

| | | ° | ″ | | |
|---|---|---|---|---|---|
| 1 | 1830·43 | 255·9 | 1·33 | Σ. | 5*n* |
| 2 | 1836·14 | 255·5 | 1·30 | Σ. | 2*n* |
| 3 | 1840·62 | 255·5 | ... | Da. | 1*n* |
| | 1840·70 | 252·4 | 1·28 | OΣ. | 2*n* |
| 4 | 1842·41 | 251·0 | 0·82 | Ma. | 1*n* |
| 5 | 1843·69 | 254·0 | 0·95 | Ma. | 1*n* |
| 6 | 1854·63 | 246·8 | 1·05 | OΣ. | 1*n* |
| 7 | 1856·61 | 247·1 | 0·85 | Se. | 2*n* |
| 8 | 1865·22 | 240·9 | 0·60 | Δ. | 7*n* |
| 9 | 1865·48 | 73·6 | 0·73 | En. | 2*n* |
| 10 | 1865·64 | 239·9 | 0·40 | Se. | 1*n* |
| 11 | 1865·76 | 241·5 | 0·74 | OΣ. | 2*n* |
| 12 | 1872·61 | 234·0 | 0·66 | OΣ. | 1*n* |
| 13 | 1873·54 | 241·1 | ... | Ferr. | 1*n* |
| | 1873·61 | 233·4 | 0·6 | Δ | 4*n* |
| | 1873·65 | 232·1 | ... | WS. | 3*n* |
| 14 | 1874·84 | 234·3 | 0·48 | Gl. | 1*n* |
| 15 | 1875·66 | 233·6 | ... | WS. | 1*n* |
| | 1875·65 | 232·1 | 0·45 | Sp. | 5*n* |
| 16 | 1877·01 | 230·1 | 0·37 | Sp. | 5*n* |
| | 1877·82 | 238·0 | ... | Δ | 1*n* |
| 17 | 1879·71 | 213·2 | 0·33 | Hl. | 3*n* |
| | 1879·79 | 243·0 | ... | Do. | 3*n* |
| 18 | 1880·67 | 217·8 | 0·32 | Sp. | 6*n* |

| | | ° | ″ | | |
|---|---|---|---|---|---|
| 18 | 1880·71 | 210·0 | ... | Do. | 2*n* |
| 19 | 1883·26 | 47·9 | 0·23 | En. | 8*n* |
| 20 | 1883·63 | 200·0 | 0·35 | Sp. | 4*n* |
| | 1883·58 | Elong. 27° | | Per. | 4*n* |
| 21 | 1886·92 | 208·6 | 0·2 ± | Sp. | 2*n* |
| | 1887·71 | Single | | Sp. | 4*n* |
| 22 | 1891·40 | 343·4 | 0·18 | β | 4*n* |

All of the measures in the foregoing list which are complete, twenty-two in number, are laid off to scale on the accompanying diagram as accurately as possible, and show at a glance all of the observed positions of this pair. The measures of 1891 are shown by outline circles in both quadrants. The successive measures are connected by lines, so that any one of them can be readily identified in the tabular list.



The resemblance between this pair and 20 *Draconis* is very striking, not only in the general direction of the components with reference to each other and their relative motions, but in the direction of the apparent movement of the respective companions. This will be very apparent by comparing the present diagram with that of 20 *Draconis* given in my paper on that pair in *Monthly Notices* for June 1891. The apparent relative motion of Σ 2525 is in the direction of about 83°, while that of 20 *Draconis*, as I have previously shown, is in the direction of 73°. Assuming that these are binary pairs—as is most probably the case—it is obvious that the apparent ellipses must be extremely elongated, and that the periods are of long duration. In a few years more,

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doubtless, we shall have data for a better determination of these points.

The place of this star (1880) is:

R.A. $19^h\ 21^m\ 40^s$ }
Decl. $+27°\ 5'$ }

*Mount Hamilton:*
1891 *October* 31.

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## *Note on some apparently variable Nebulæ.*
### By J. L. E. Dreyer, Ph.D.

In his ninth list of new nebulæ found at the Warner Observatory (*Astr. Nachr.*, No. 3004), Mr. Lewis Swift gave under No. 13 the following position (for 1890) and description of a nebula:

| | | | |
|---|---|---|---|
| 1889 December 23 | $3^h\ 36^m\ 6^s$ | 95° 2′·1 | — *ee*F, *p*L, R, 1st of 3 in line with 1417–18, cometary. Unable to refind it; seeing good. Failed also at Harvard College Observatory. |

In No. 3014 of the same journal Mr. Swift remarks about this object: "I strongly suspect it to have been a comet, as at two subsequent examinations it could not be found. It was in line with N.G.C. 1417 and 1418, and all three were seen simultaneously."

From an examination of all the observations of nebulæ in the region in question, it appears to me to be more likely that we have here to do with a variable nebula and not with a comet. The following positions are all reduced to 1860:

| | h | m | s | ° | ′ | ″ | |
|---|---|---|---|---|---|---|---|
| | | | | *Sir William Herschel.* | | | |
| III. 569 | 3 | 32 | 54 | 95 | 7 | | eF, *l*E, *er* |
| II. 455 | 3 | 34 | 59 | 95 | 8 | | Two, the *p* one *p*B, *c*L, E, *lb*M, the *f* one *e*F, *v*S, E. |
| II. 456 | 3 | 35 | 26 | 95 | 9 | | |
| | | | | *Sir John Herschel.* | | | |
| *h* 305 | 3 | 34 | 32·5 | 95 | 7 ± | | No descr. 1st of 3 (one observation). |
| *h* 306 | 3 | 34 | 41·4 | 95 | 8 | 48 | R, *np a* ✶, 2nd of 3 (one obs.): |
| *h* 307 | 3 | 35 | 1·8 | 95 | 9 | 36 | *p*B, S, B ✶ 1′ *sf* (3 obs.). |
| | | | | *d'Arrest.* | | | |
| III. 569 | 3 | 32 | 49·0 | 95 | 7 | 18 | (2 obs.) |
| II. 455 | 3 | 35 | 0·5 | 95 | 9 | 28 | (6 obs.) |
| II. 456 | 3 | 35 | 19·0 | 95 | 11 | 10 | (3 obs.) |